Geologic Characterization of Barnegat Bay-Little Egg Harbor Estuary

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U.S. Department of the Interior
U.S. Geological Survey

Outline

1. Summary of Estuarine Acoustic Data Acquisition *(slides 1-2)*

2. Acoustic Data Products and Status *(slides 3-7)*

1. Pre- and Post-Sandy Estuarine Lidar Data Products *(slides 8-9)*

2. Interpretive Data Products
   - Sediment Distribution *(slide 10)*
   - Geologic History *(slide 11)*
   - Topo-bathymetric models *(slides 12-15; presented by Brian Andrews)*

1. Summary & Acknowledgements *(slides 16-17)*

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1. Data Acquisition Summary

• Four geophysical surveys between November 2011 and September 2013

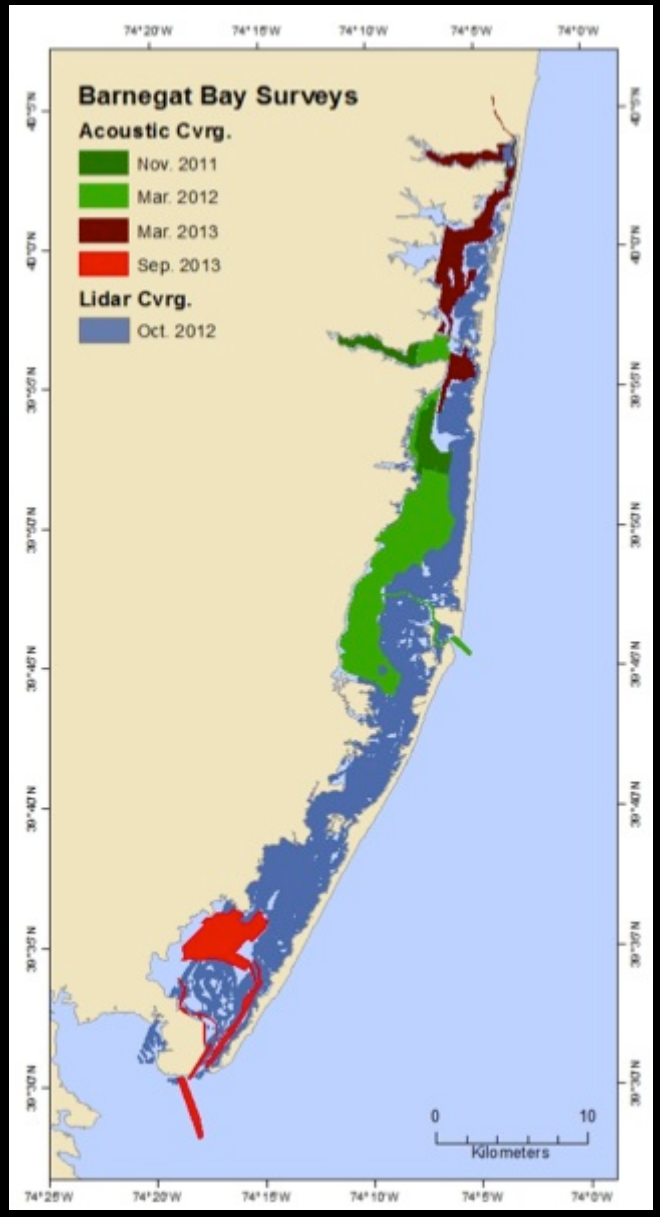
• Water depths >1.5 m mapped acoustically: interferometric bathymetry, side scan sonar, seismic reflection

• Water depths < 1.5 m mapped optically using USGS EAARL topo-bathymetric lidar

-pre-Sandy flights flown 18-26 Oct 2012

-post-Sandy flights between 1 Nov 2012 and 10 Jan 2013

• Sediment samples, bottom photos, and bottom video collected based on side scan mosaic



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1. By the Numbers: Seafloor Characterization

- Covered ~100 km^2 with acoustic instruments
- Collected > 2000 line-kilometers of acoustic data
- Collected 342 bottom photos
- Collected 186 sediment samples
- Covered ~300 km^2 with topo-bathymetric lidar

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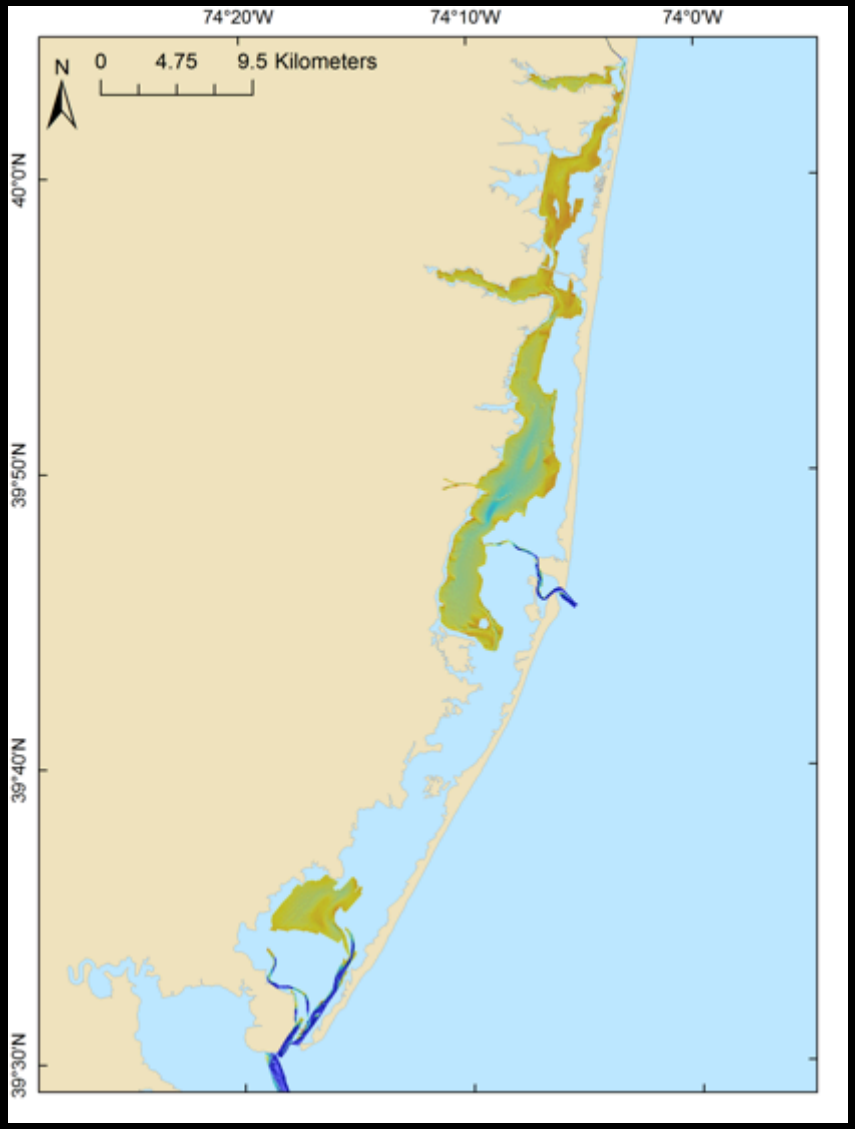
2. Data Products: Estuarine Bathymetry

- Four surveys were merged
- 10-m continuous grid created
- Updates 1938 survey in water depths >1.5m
- Vertical resolution +- 15cm
- Helped to verify pre-Sandy lidar returns
- Useful for a variety of applications



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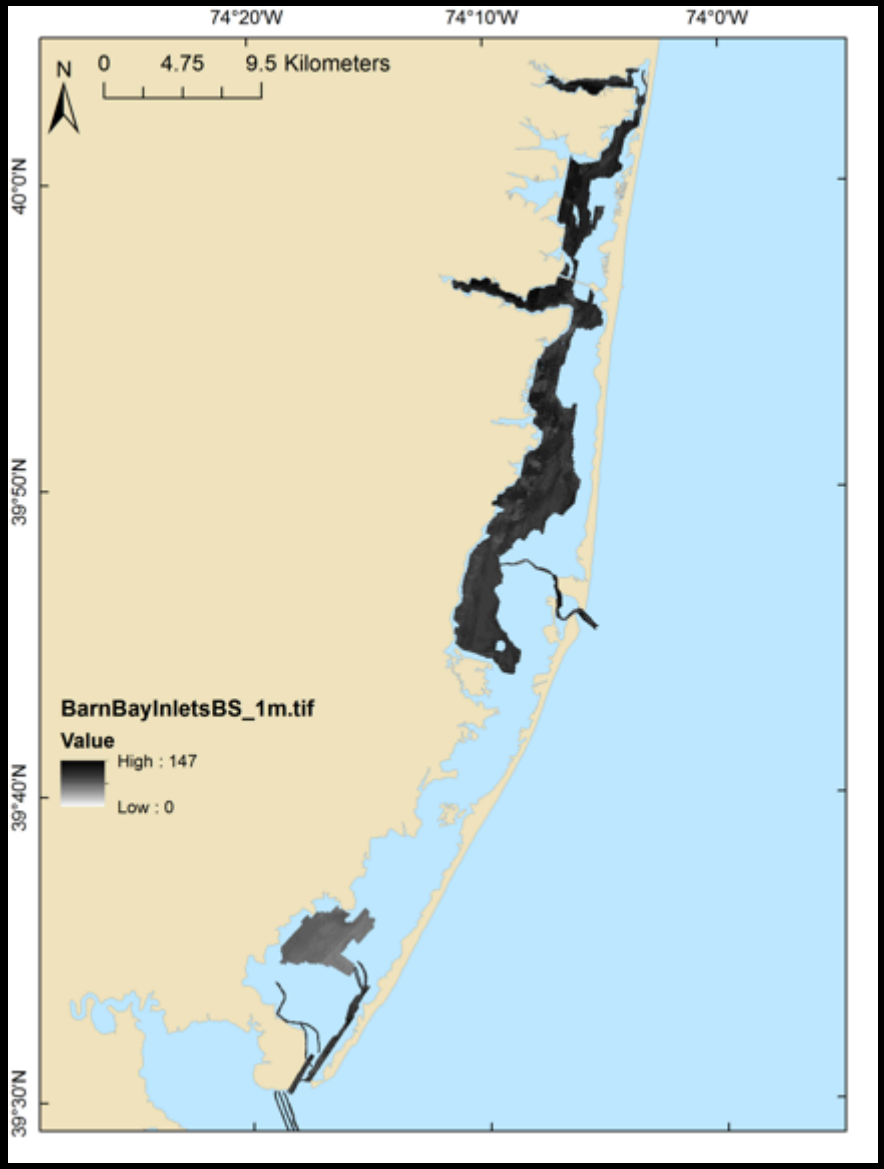
2. Data Products: Estuarine Backscatter

- Backscatter mosaic merges 4 surveys and data from 3 different instruments
- Indicates changes in surficial sediment type and roughness
- Provided in Geotiff format



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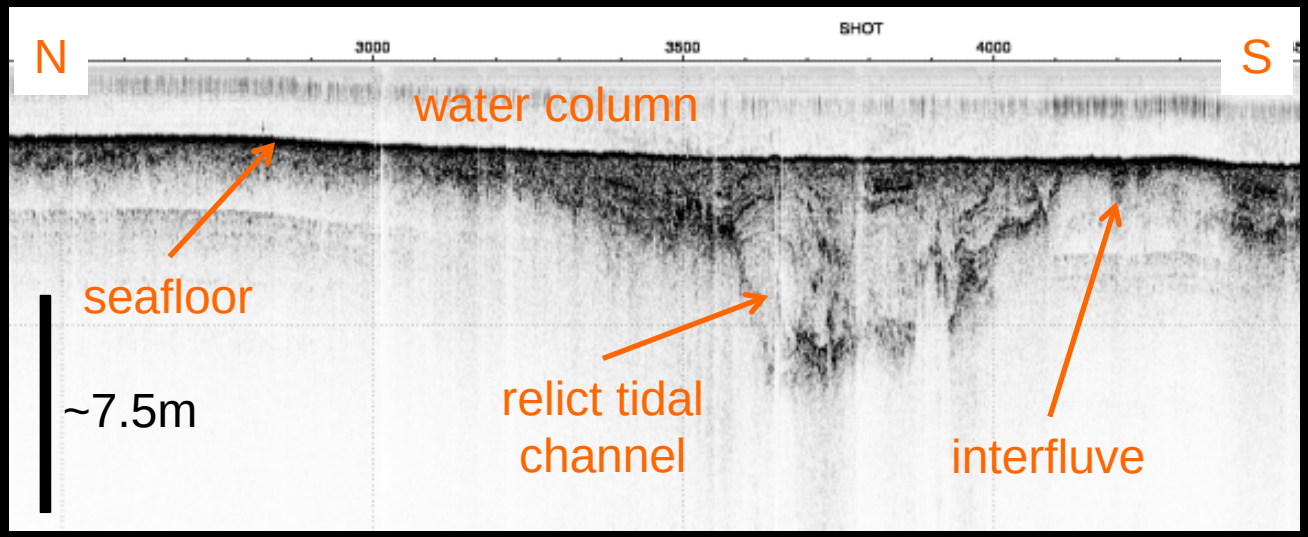
2. Data Products: Estuarine Seismic



From central Barnegat Bay

- Useful for understanding the geologic history of the bay
- Images of each line and trackline locations provided

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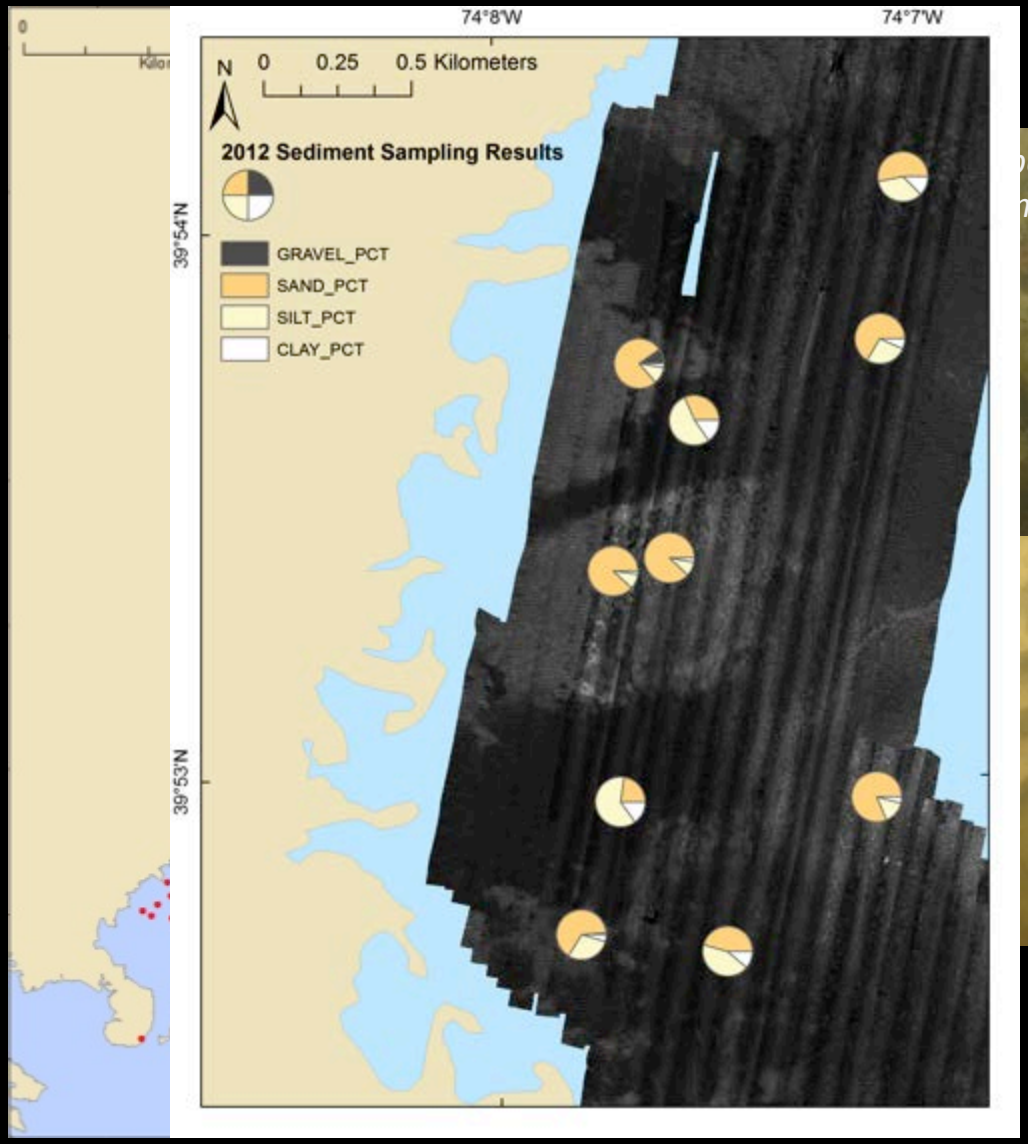
2. Data Products: Sediment Characterization

- Sediment samples, bottom photos and bottom video collected after 3 surveys
- Grain size analysis is complete
- Sample locations, photos, video, and grain size data are provided



2. Data Products: Expected Data Release

- ***Suggested citation (report # TBD)***
  - Andrews, B.D., Miselis, J.L., Danforth, W.W., Irwin, B.J., Worley, C.R., Bergeron, E.M., and Blackwood, D.S., in press. *Marine geophysical data collected in a shallow back-barrier estuary: Barnegat Bay, New Jersey: U.S. Geological Survey Data Series XXX, doi XXX.*

- ***What will be in the data release?***
  - Bathymetry tracklines and grids
  - Backscatter tracklines and geotiffs
  - Seismic tracklines and profile images
  - Sediment sampling and photo locations, video tracklines, photos, and grain size results

- ***What is the status?***
  - Metadata review complete; will likely have a publication # and link in 6-8 weeks.

- ***Where can I find it?***
  - Once officially published, the publication will be offered online only to facilitate data downloads.

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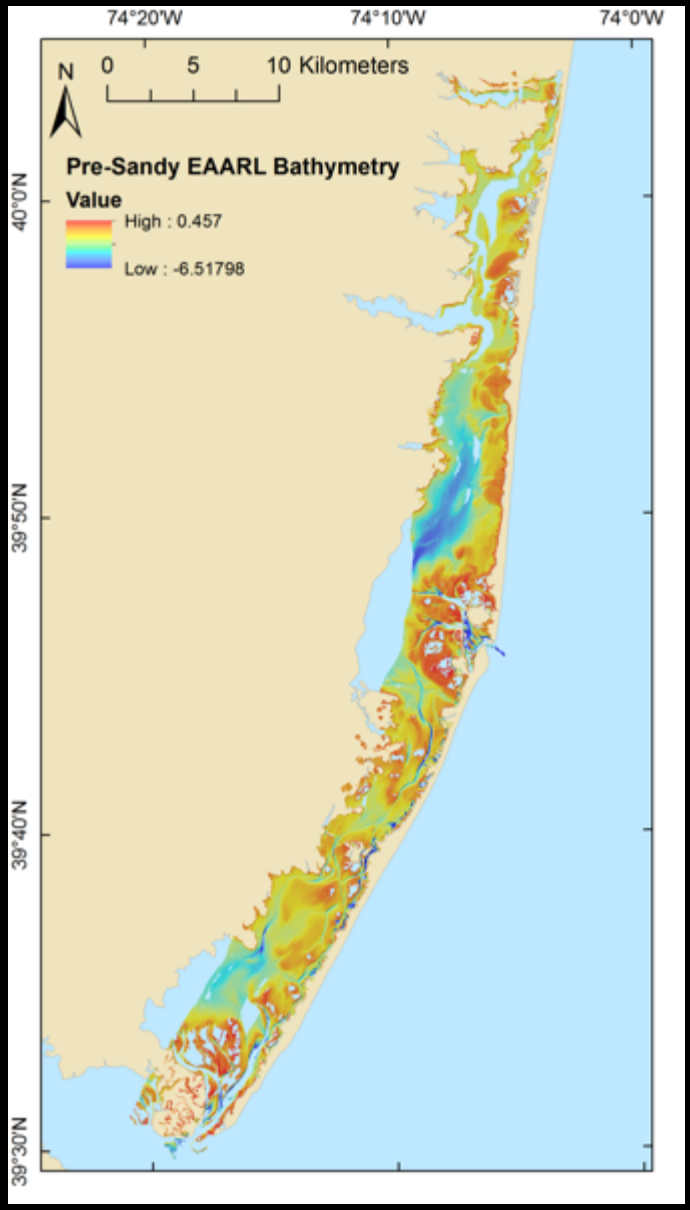
3. Lidar Bathymetry: Pre-Sandy

- Water clarity was ideal for data collection
- Western flight lines incomplete due to redirection of instrument to regional pre-Sandy assessments
- These data combined with the acoustic data allow for almost 100% bathymetric coverage of the bay
- Final processing complete for entire dataset



Citation:

Wright, C.W., Troche, R.J., Klipp, E.S., Kranenburg, C.J., Fredericks, X. and Nagle, D.B., 2014. EAARL-B submerged topography-Barnegat Bay, New Jersey, pre-Hurricane Sandy, 2012: U.S. Geological Survey Data Series 885, doi 885.

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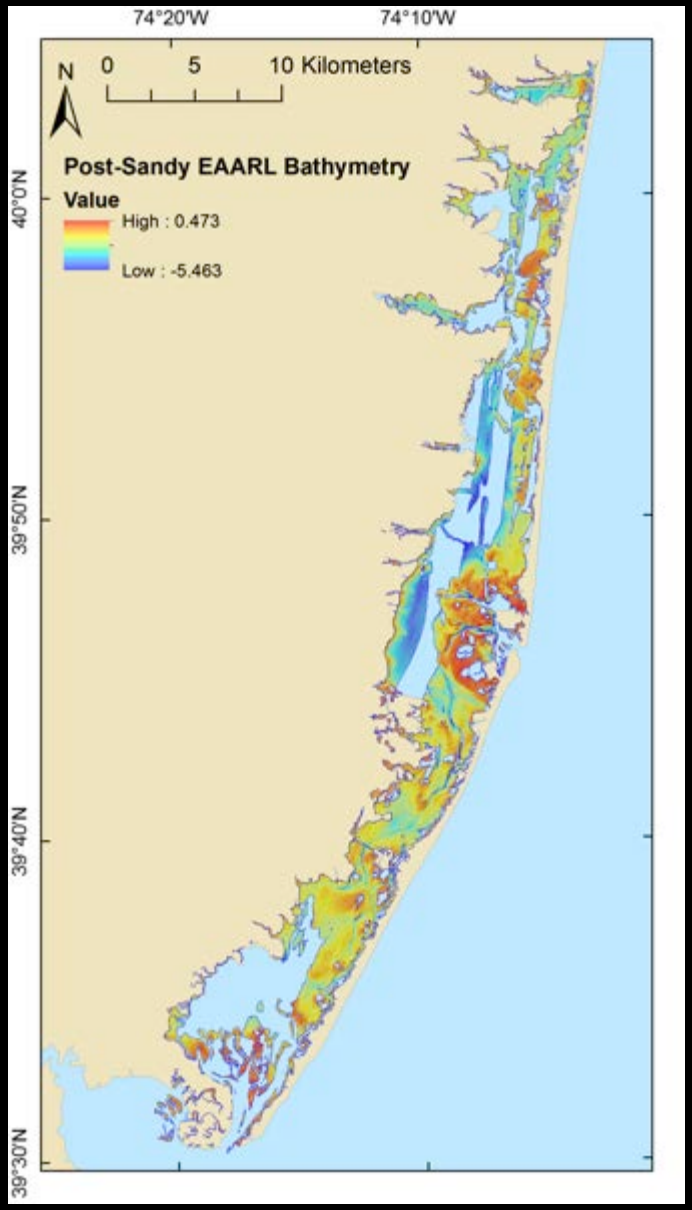
3. Lidar Bathymetry: Post-Sandy

- Post-Sandy lidar coverage less extensive due to degradation of water clarity
- Data collection occurred over 2+ months
- Final processing is completed

Citation:

Wright, C.W., Troche, R.J., Kranenburg, C.J., Klipp, E.S., Fredericks, X. and Nagle, D.B., 2014. EAARL-B submerged topography-Barnegat Bay, New Jersey, post-Hurricane Sandy, 2012-2013: U.S. Geological Survey Data Series 887, doi 887.



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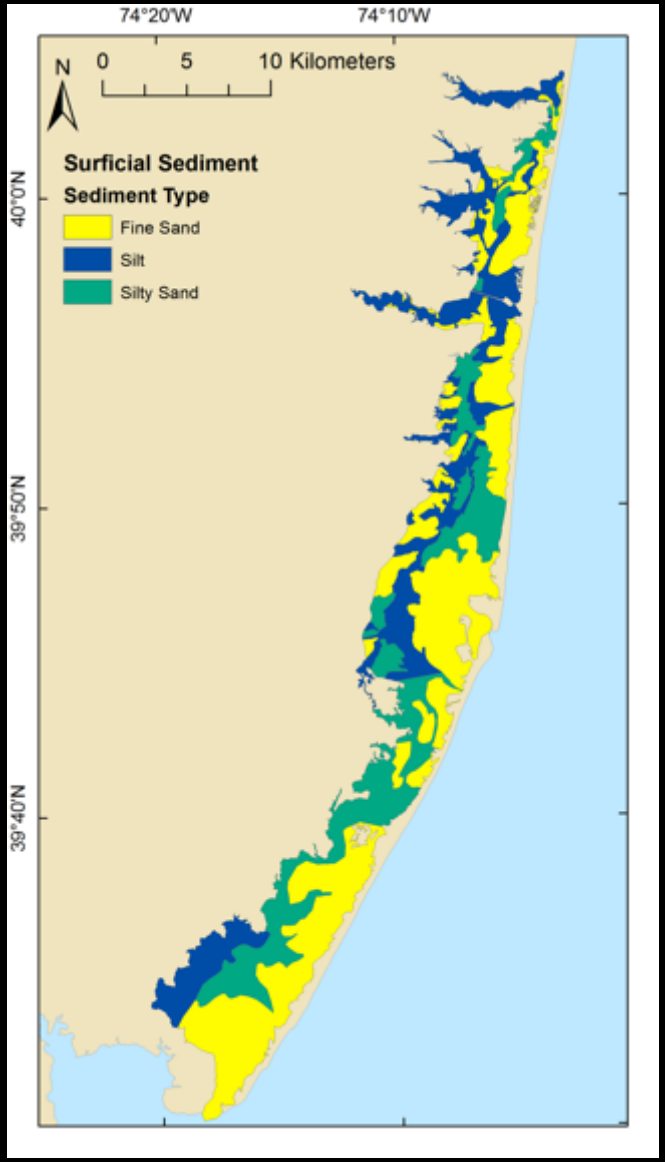
4. Interpretive Data Products: Sediment Distribution

- Represents the integration of sediment sampling, backscatter, and geomorphology of the bay
- Simplified to 3 dominant size classes at this regional scale
- Publication expected in 2015



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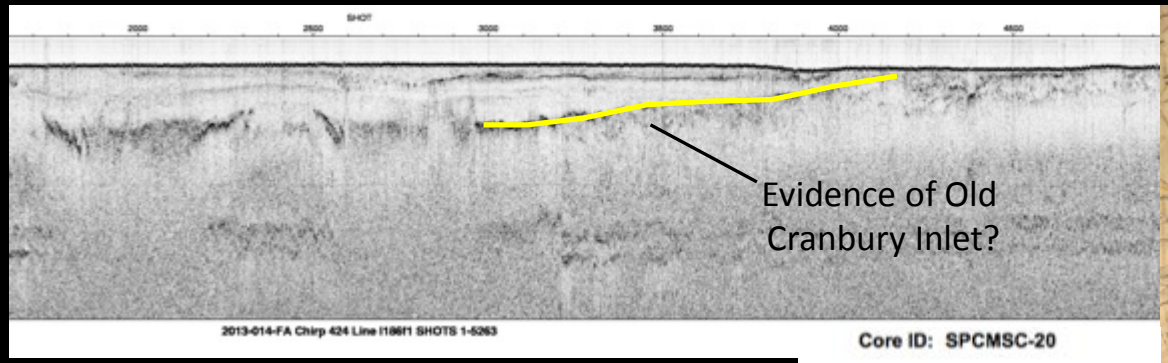
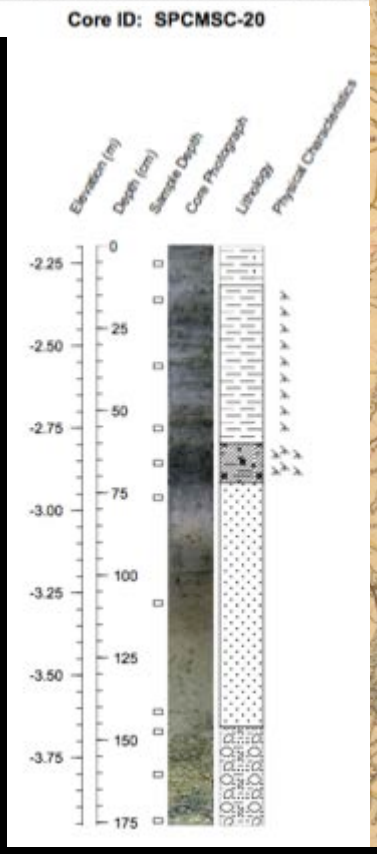
4. Interpretive Data Products: Geologic History



- Seismic data have been fully processed
- Collaboration with Rob Tunstead at USDA-NRCS to collect vibracores to look at vertical sediment distribution
- Will verify seismic data
- Publication expected in 2015

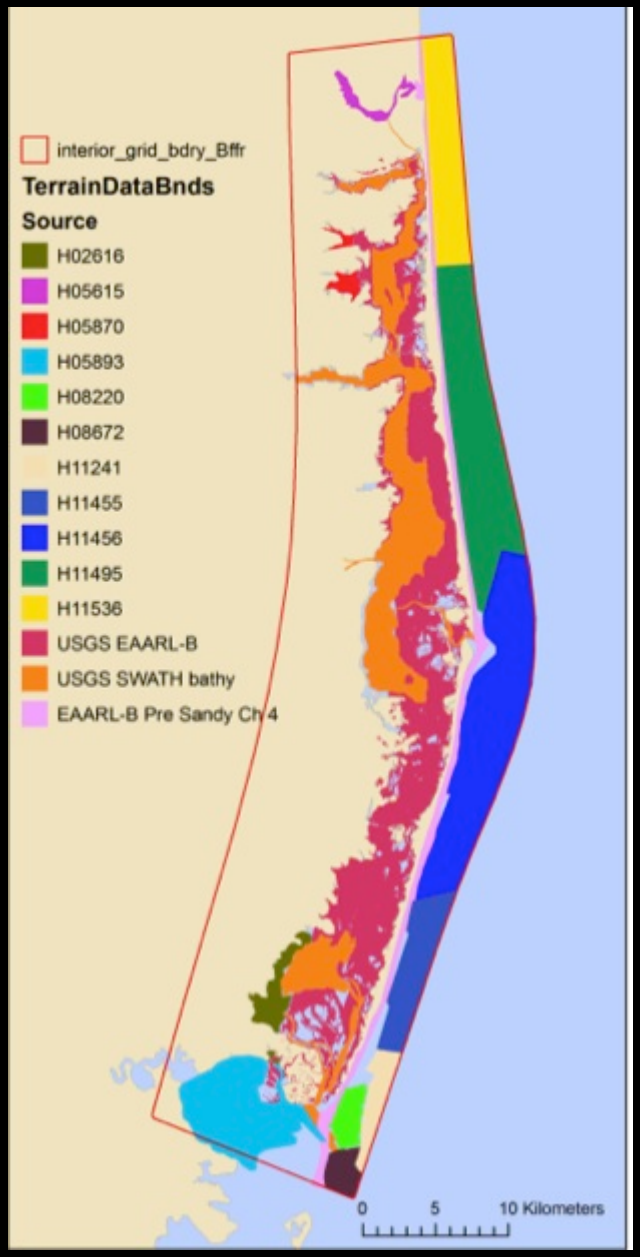


4. Interpretive Data Products: Terrain Model

• 15 different data sources between 1934 and 2013

• Modern inputs are:
  -USGS acoustic bathymetry *(this project)*
  -USGS lidar bathymetry *(this project)*,
  -USGS lidar topography
  -USGS NJ/NED state topography

•Various resolutions (lead line to multibeam and LIDAR), formats, and horizontal and vertical reference systems.



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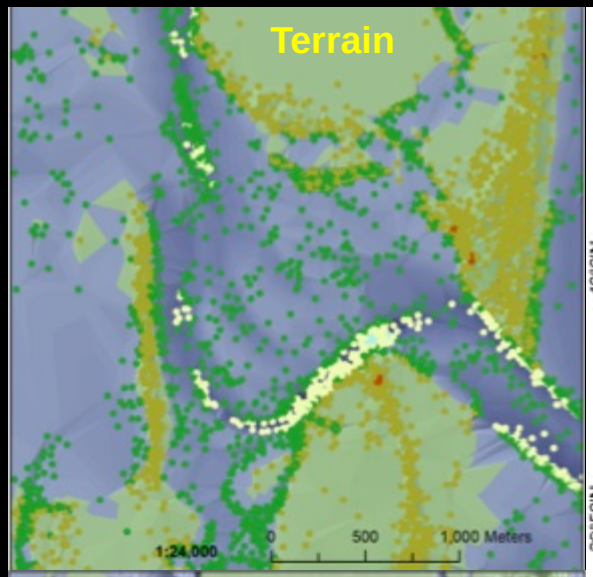
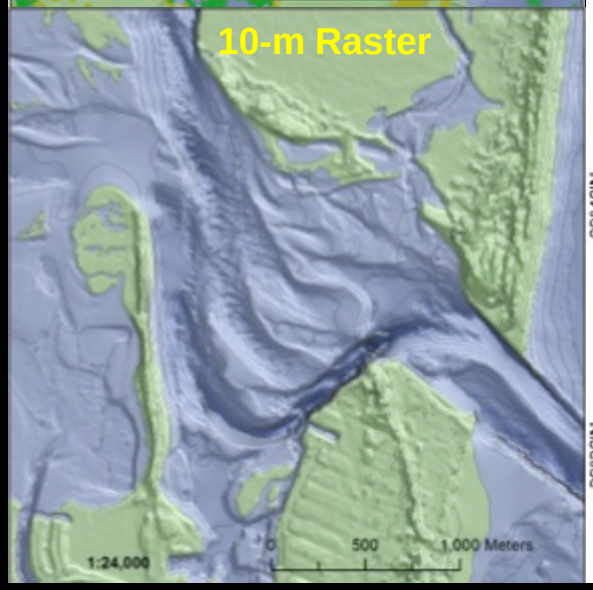
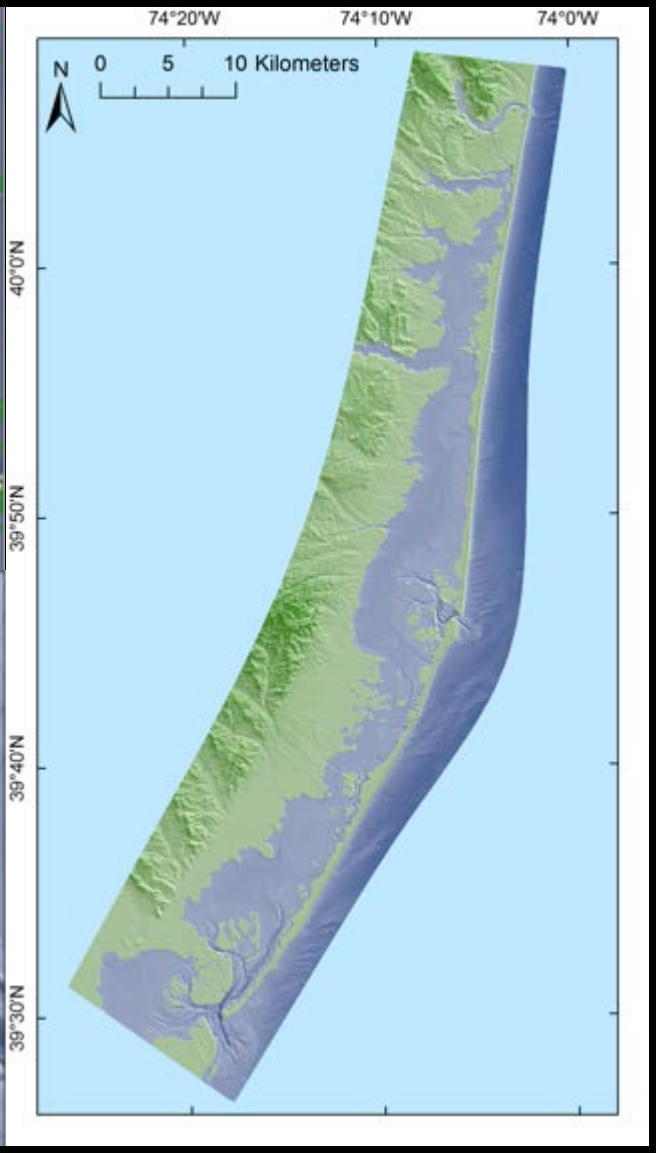
4. Terrain Model Summary

- Terrain Model uses a multiresolution TIN data model
- Stored as points and exported as raster using Natural Neighbors.
- Product (or iterations of this product) has been used by USGS CMGP hydrodynamic and sediment transport modelers
- Planned public release: April 2015







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4. 3DEP–CZ: Sandy-New Jersey / Delaware Region Integrated Topobathymetric Elevation Model (2014)

Slide courtesy of Jeff Danielson, USGS EROS

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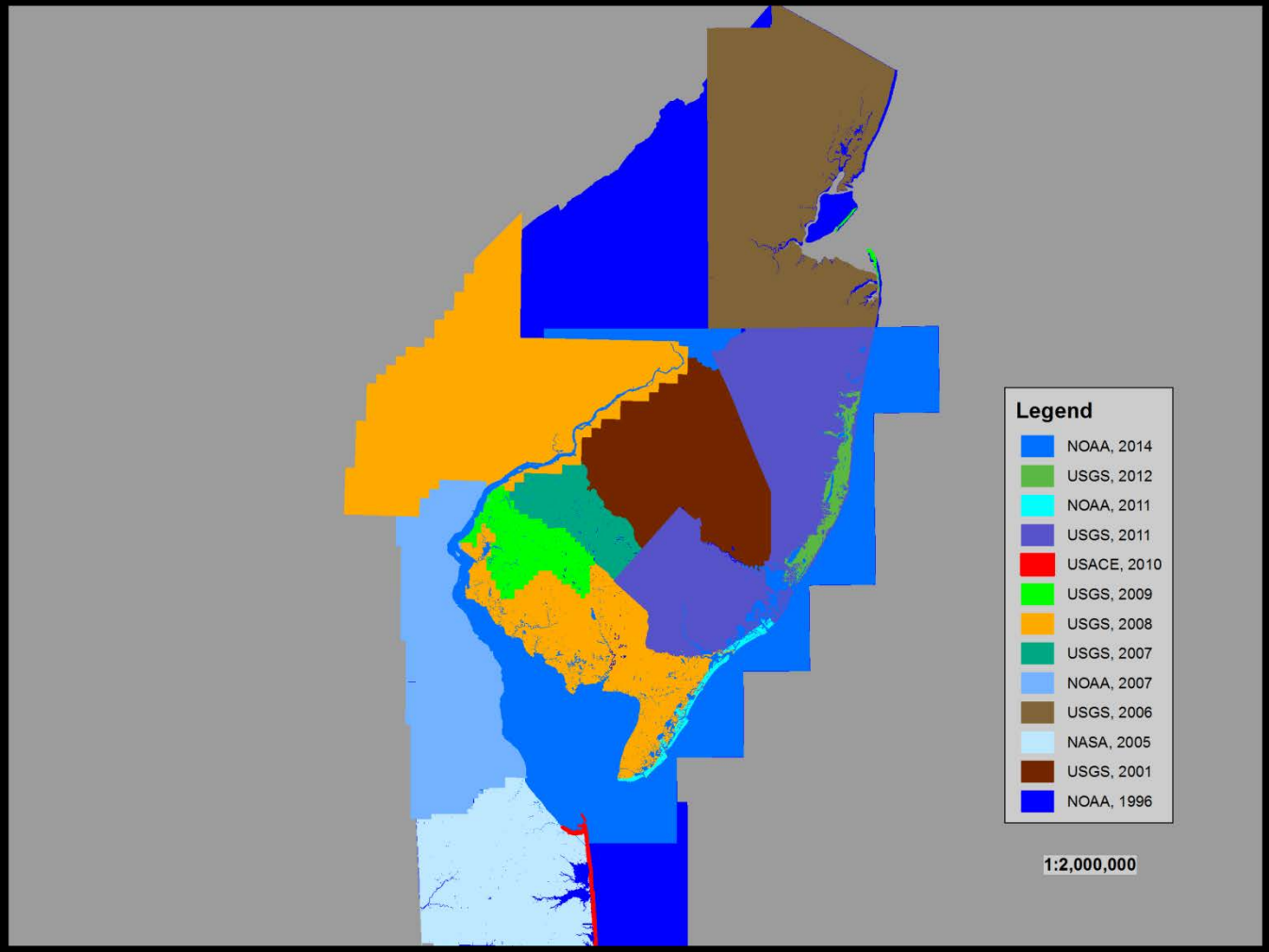
4. 3DEP–CZ: New Jersey / Delaware Region (Version-1) 1-Meter Integrated Model Metadata



Slide courtesy of Jeff Danielson, USGS EROS

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6. Summary

Data release (bathymetry grids, backscatter mosaic, sediment sampling results, and seismic data) scheduled for mid to late April 2015.

Release of Barnegat Bay terrain model scheduled for April 2015.

Publication of interpretive acoustic products (e.g., stratigraphic interpretation) pending completion of vibracore analysis.

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6. Project Personnel & Collaborators

Seafloor Mapping

• Jane Denny, Brian Andrews, Emile Bergeron, Dann Blackwood, Bill Danforth, Dave Foster, Barry Irwin, Eric Moore, Aaron Turecek, Chuck Worley

Hydrodynamic modeling

• Neil Ganju, Zafer Defne, John Warner, Rich Signell, Alfredo Aretxabaleta

NJ Water Science Center

• Tony Navoy, Bob Nicholson

NJ Department of Environmental Protection

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